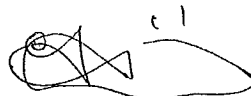


DECLARATION

I, the undersigned, Yoko OISHI, located at 2nd Floor, Kyohan Building, 2-7, Kandanishiki-cho, Chiyoda-ku, Tokyo 101-0054, JAPAN, do solemnly and sincerely declare that I fully understand the Japanese Language and the English Language and that the attached translation from the Japanese Language to the English Language of Japanese Patent Application No. 2003-64423 filed on March 11, 2003, (Reference Number: 543157JP01) is a true, correct and good-faith translation to the best of my knowledge and belief.

Dated this 19th day of April, 2011

A handwritten signature in black ink, consisting of a stylized 'Y' and 'O' followed by a horizontal line and a small '1'.

Yoko OISHI

[Name of Document]	PATENT APPLICATION
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[Name of Item]	Abstract	1
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[Name of the Document] SPECIFICATION
[Title of the Invention] METHOD FOR WRITING IN NONVOLATILE
MEMORY, ELECTRIC APPARATUS USED FOR THE SAME, AND ROM
WRITER

[Claims]

[Claim 1]

A writing method comprising an electrical apparatus incorporating a nonvolatile memory in which data is rewritable when a writing control terminal is pulled down or pulled up to a predetermined voltage; and a ROM writer that writes data in the nonvolatile memory, characterized in that the electrical apparatus includes a generation circuit for generating the predetermined voltage and the ROM writer includes means that connects the predetermined voltage generated by the generation circuit to the writing control terminal.

[Claim 2]

An electrical apparatus constituting the writing method according to claim 1 characterized by comprising an interface that includes: the writing control terminal; and a voltage terminal that outputs the predetermined voltage generated by the generation circuit.

[Claim 3]

A ROM writer connected to the electrical apparatus according to claim 2, characterized by comprising an interface including means that can be connected to the interface and short-circuits the writing control terminal and the voltage terminal when the means is connected to the interface.

[Claim 4]

A writing method comprising an electrical apparatus incorporating a nonvolatile memory in which data is rewritable when a writing control terminal is pulled down or pulled up to a predetermined voltage; and a ROM writer that writes data in the nonvolatile memory, characterized in that the electrical apparatus has an interface

including the writing control terminal and a setting circuit for setting the writing control terminal to the predetermined voltage, and the ROM writer has an interface including trigger means that can be connected to the interface and turns ON the setting circuit when the trigger means is connected to the interface.

[Claim 5]

An electrical apparatus constituting the writing method according to claim 4, characterized in that the setting circuit is a circuit unit comprising a light-receiving element that turns ON/OFF an operation for setting the writing control terminal to the predetermined voltage according to whether the light-receiving element receives light of a specific wavelength exceeding a predetermined intensity.

[Claim 6]

A ROM writer connected to the electrical apparatus according to claim 5, characterized in that the trigger unit is a circuit unit comprising a light-emitting element that irradiates light of a specific wavelength on the light-receiving element.

[Claim 7]

An electrical apparatus constituting the writing method according to claim 4, characterized in that the setting circuit is a circuit unit comprising a relay for turning ON/OFF an operation for setting the writing control terminal to the predetermined voltage according to whether the relay gives a specific current to a coil control line.

[Claim 8]

A ROM writer connected to the electrical apparatus according to claim 7, characterized in that the trigger unit is a circuit unit including a voltage terminal that gives a specific current to the coil control line.

[Claim 9]

An electrical apparatus constituting the writing method according to claim 4, characterized in that the setting circuit is a circuit unit comprising a mechanism switch that turns ON/OFF an operation for setting the writing control terminal to the predetermined voltage according to whether the mechanism switch is pushed in.

[Claim 10]

A ROM writer connected to the electrical apparatus according to claim 9, characterized in that the trigger unit is a projection for pushing in the mechanism switch.

[Claim 11]

An electrical apparatus constituting the writing method according to claim 4, characterized in that the setting circuit is a circuit unit comprising a thermostatic lead switch that turns ON/OFF an operation for setting the writing control terminal to the predetermined voltage according to whether the thermostatic lead switch is heated.

[Claim 12]

A ROM writer connected to the electrical apparatus according to claim 11, characterized in that the trigger unit is a heater for heating the thermostatic lead switch.

[Claim 13]

An electrical apparatus constituting the writing method according to claim 4, characterized in that the setting circuit is a circuit unit comprising a magnetic lead switch that turns ON/OFF an operation for setting the writing control terminal to the predetermined voltage according to whether magnetism is applied to the magnetic lead switch.

[Claim 14]

A ROM writer connected to the electrical apparatus according to claim 13, characterized in that the trigger unit is a magnet or an electromagnet for applying magnetism to the magnetic lead switch.

[Claim 15]

A writing method comprising an electrical apparatus incorporating a nonvolatile memory in which data is rewritable when a writing control terminal is pulled down or pulled up to a predetermined voltage; and a ROM writer that rewrites data in the nonvolatile memory, characterized in that the electrical apparatus includes, in an interface, the writing control terminal; switching means that switches the writing control terminal to the predetermined voltage; a signal terminal; and separating means that separates a signal inputted to the signal terminal into a data signal for writing and a

trigger signal for controlling the switching means, and the ROM writer includes an interface including means that can be connected to the interface and outputs a synthesized data signal, which is obtained by synthesizing the data signal for writing and the trigger signal for controlling the switching means, to the signal terminal when the means is connected to the interface.

[Claim 16]

An electrical apparatus constituting the writing method according to claim 15, characterized in that the separating means includes a low-pass filter and the switching means includes a flip-flop.

[Claim 17]

A ROM writer connected to the electrical apparatus according to claim 16, characterized in that the synthesized data signal is a logical product of the data signal for writing and a clock signal.

[Claim 18]

A ROM writer connected to the electrical apparatus according to claim 16, characterized in that the synthesized data signal is a signal in which a start bit signal and the data signal for writing are arranged in the order.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to an electrical apparatus incorporating an electrically rewritable nonvolatile memory, a ROM writer that writes data in this nonvolatile memory, and a writing method using the electrical apparatus and the ROM writer.

[0002]

[Prior Art]

In a conventional method of writing, when a ROM writer is connected to a terminal apparatus via connecting means, a STBY terminal of an MPU in the terminal apparatus is connected to a ground terminal in the ROM writer. This brings the terminal apparatus into a standby state and makes it possible to write a program in the terminal

apparatus. Thus, update of the program for an EEPROM can be performed without soldering work (refer, for example, to Patent Reference 1).

[0003]

[Patent Reference 1]

Japanese Published Unexamined Patent Application No. H2-130799 (Fig. 1)

[0004]

[Problem to be Solved by the Invention]

The conventional ROM writer, the conventional electrical apparatus, and the conventional writing method using the ROM writer and the electrical apparatuses are configured as described above and have problems described below.

[0005]

Since only the ground terminal is disposed in the ROM writer, the conventional ROM writer, the conventional electrical apparatus, and the conventional writing method using the ROM writer and the electrical apparatuses can be applied to an apparatus incorporating a microcomputer that changes to a writing mode when the microcomputer is pulled down to a ground level but cannot be applied to an apparatus incorporating a microcomputer that changes to a writing mode when the microcomputer is pulled up to a predetermined voltage.

As a result, in writing, it is necessary to provide a ROM writer according to specifications of a microcomputer incorporated in the apparatus.

[0006]

The invention has been devised in order to solve such problems and an objective of the invention is to provide a ROM writer and an electrical apparatus with high universality that can be used regardless of specifications of microcomputers, and a writing method using the ROM write and the electrical apparatus.

[0007]

[Means for Solving the Problem]

A method of writing according to the invention is a writing method comprising an electrical apparatus incorporating a nonvolatile memory in which data is rewritable

when a writing control terminal is pulled down or pulled up to a predetermined voltage; and a ROM writer that writes data in this nonvolatile memory wherein the electrical apparatus includes a generation circuit for generating the predetermined voltage and the ROM writer includes means that connects the predetermined voltage generated by the generation circuit to the writing control terminal.

[0008]

[Embodiment of the Invention]

First embodiment

An electrical apparatus will be explained with a communication adapter for connecting a home appliance to an external network as an example.

Fig. 1 shows a state in which a home appliance 6 is connected to an external apparatus via an electrical apparatus (a communication adapter) 1 according to this embodiment.

In the figure, the electrical apparatus (the communication adapter) 1 includes an external network interface connected to an external network such as Ethernet (registered trademark), a microcomputer incorporating a nonvolatile memory, and a serial interface 7 connected to the home appliance 6. The serial interface 7 for connection with the electrical apparatus (the communication adapter) 1 is also disposed in the home appliance 6.

[0009]

With such a structure, the electrical apparatus (the communication adapter) 1 operates the home appliance 6 connected to the electrical apparatus itself according to a control signal from the external network interface and monitors a state of the home appliance 6 to notify other electrical appliances connected to the external network of information on this state.

[0010]

Fig. 2 is a diagram for explaining an operation for writing a program in the nonvolatile memory incorporated in the electrical apparatus 1. In the figure, a ROM writer 2 for writing a program in the nonvolatile memory is connected to the serial

interface 7 of the electrical apparatus 1 instead of the home appliance 6.

In addition, a writing control terminal CNVss 4 is disposed in the electrical apparatus 1. A microcomputer, which is switched to a writing mode when the writing control terminal CNVss 4 is pulled down to a low potential level "L", is mounted on the electrical apparatus 1.

Writing of a program in the nonvolatile memory will be hereinafter explained on the basis of the figure.

[0011]

The writing control terminal CNVss 4 of the electrical apparatus 1 is usually pulled up at a voltage VCC. The pulled-up writing control terminal CNVss 4 and a ground terminal (hereinafter referred to as "GND terminal") are outputted to the serial interface 7.

[0012]

On the other hand, a short-circuit 5, through which the writing control terminal CNVss 4 and the GND terminal are short-circuited when the electrical apparatus 1 and the ROM writer 2 are connected, is disposed in a serial interface 7' of the ROM writer 2.

[0013]

Therefore, by connecting the electrical apparatus 1 and the ROM writer 2, the writing control terminal CNVss 4 is short-circuited to be pulled down to the low potential level "L" and the microcomputer changes to the writing mode and can write a new program in the nonvolatile memory via a TXD (Transmitted Data) terminal or an RXD (Received Data) terminal.

[0014]

In the explanation of this embodiment, the microcomputer changes to the writing mode by pulling down the writing control terminal CNVss 4 to the low potential level "L". The same holds true for a microcomputer that is switched to the writing mode by pulling up the writing control terminal CNVss 4 to a working voltage (5 V) of the microcomputer or a predetermined voltage of a common power supply line (12 V) on a

circuit board.

[0015]

In this case, as shown in Fig. 3, the writing control terminal CNVss 4 is usually grounded. A terminal, to which a predetermined voltage is outputted, is disposed in the serial interface 7 on the electrical apparatus 1 side together with the writing control terminal CNVss 4. On the other hand, a short-circuit, through which the terminal with the predetermined voltage and the writing control terminal CNVss 4 are short-circuited when the electrical apparatus 1 and the ROM writer 2 are connected, is provided in the serial interface 7' on the ROM writer 2 side. With such a structure, it is possible to switch the microcomputer to the writing mode using the same ROM writer 2 as described above.

[0016]

In this way, in the electrical apparatus 1 incorporating the nonvolatile memory according to the invention, the writing control terminal CNVss 4 and the voltage terminal, to which the predetermined voltage for switching the writing control terminal CNVss 4 is outputted, are disposed in the serial interface 7. The serial interface 7' of the ROM writer 2 is constituted such that the writing control terminal CNVss 4 and the voltage terminal are short-circuited when the serial interface 7' is connected to the electrical apparatus 1.

[0017]

As a result, when the serial interfaces 7 and 7' are connected, regardless of specifications (pull-down, pull-up) of the microcomputer, the microcomputer always switches to the writing mode and shifts to a state in which the microcomputer can write a new program via the TXD terminal and the RXD terminal. In this way, it is possible to provide a ROM writer 2 and an electrical apparatus having high universality and a writing method using the ROM writer 2 and the electrical apparatus.

[0018]

In the explanation of this embodiment, the communication adapter is cited as an example in this embodiment. However, the invention is not limited to this. For

example, the same explanation is applied to a case in which the electrical apparatus is a home appliance such as an air conditioner or a microwave and, in order to write a new program in a nonvolatile memory of a microcomputer incorporated in this home appliance, the ROM writer 2 is connected to the serial interface 7 disposed in the home appliance to write the program.

[0019]

In the explanation of this embodiment, one writing control terminal CNVss 4 is provided. However, the same explanation is applied to a case in which there are plural writing control terminals. When there are plural writing control terminals, a circuit for short-circuiting a GND terminal and a writing control terminal only has to be provided on the ROM writer 2 side for the respective writing control terminals.

[0020]

Note that, in the explanation of this embodiment, the circuit for directly short-circuiting the writing control terminal CNVss 4 and the GND terminal is provided. However, it is needless to mention that any structure is acceptable as long as the writing control terminal CNVss 4 of the electrical apparatus 1 and the low potential level "L" is short-circuited when the electrical apparatus 1 and the ROM writer 2 are connected.

In embodiments to be described below, various cases in which the writing control terminal CNVss 4 is short-circuited when connected will be explained.

[0021]

Second embodiment

In the first embodiment, the writing control terminal CNVss 4 and the GND terminal are short-circuited via the short-circuit 5 to set the microcomputer to the writing mode. However, as shown in Fig. 4, it is also possible that a photodiode 48 is connected to the writing control terminal CNVss 4, an LED 9 is mounted on the ROM writer 2, the ROM writer 2 is connected to the serial interface 7 of the electrical apparatus 1, and when a new control program is written, the LED 9 is lighted to feed a photoelectric current to the photodiode 48 and set the writing control terminal CNVss 4 to the low potential level "L".

[0022]

As a structure of a connection part in the serial interfaces 7 of the ROM writer 2 and the electrical apparatus 1, for example, it is sufficient that the connection part is covered with a shielding rubber 10 at the time of normal use to prevent the microcomputer from changing to the writing mode as shown in Fig. 5 and the shielding rubber is pushed and removed by the LED 9 on the ROM writer 2 side such that light of the LED 9 is received by the photodiode 8 at the time of writing by the ROM writer 2.

[0023]

As described above, in the electrical apparatus according to this embodiment, the low potential level "L" for switching the microcomputer to the writing mode is provided such that the writing control terminal is pulled down to the low potential level "L" when the photodiode receives light. Thus, as in the first embodiment, the ROM writer 2 only has to have a light-emitting element such as an LED. It is unnecessary to change the ROM writer 2 according to specifications of the microcomputer of the electrical apparatus 1 and it is possible to provide the ROM writer 2 and an electrical apparatus having high universality and a writing method using the ROM writer 2 and the electrical apparatus.

[0024]

Third embodiment

In the second embodiment, optical coupling structure using the photodiode 8 is explained. However, as shown in Fig. 6, a phototransistor 11 may be used as a light-receiving element. The LED 9 is lighted to feed a photoelectric current to the phototransistor 11 instead of the photodiode 8, whereby the writing control terminal CNVss 4 is changed to the GND level. An advantage in this case is the same as that explained in the first embodiment; thus, an explanation of the advantage is omitted.

[0025]

Fourth embodiment

In the first embodiment, the writing control terminal CNVss 4 is short-circuited via the short-circuit 5 to set the writing control terminal CNVss 4 to a voltage level of the

writing mode. However, as shown in Fig. 7, it is also possible that a mechanism switch 12, which is turned ON when pushed in, is connected to the writing control terminal CNVss 4 and exposed from the serial interface 7 and a projection making it possible to push in the switch is provided in the ROM writer 2 such that, when the ROM writer 2 is connected to a serial interface of a main body, the switch can be turned ON by the projection provided on the ROM writer 2 side. Since an advantage in this case is the same as that explained in the first embodiment, an explanation of the advantage is omitted.

[0026]

Fifth embodiment

In the first embodiment, the writing control terminal CNVss 4 is short-circuited via the short-circuit 5 to set the writing control terminal CNVss 4 to a voltage level of the writing mode. However, as shown in Fig. 8, it is also possible that a contact of a relay 13, which is open at the normal time, is connected to the writing control terminal CNVss 4 and a coil control line of the relay is outputted to the serial interface 7 side as a terminal such that, when the ROM writer 2 is connected to the serial interface 7 of the electrical apparatus 1, a voltage for operating the relay is applied to this coil control line, whereby the relay is turned ON and the writing control terminal CNVss 4 is pulled down to the GND level. An advantage in this case is the same as that explained in the first embodiment; thus, an explanation of the advantage is omitted.

[0027]

Sixth embodiment

In the first embodiment, the writing control terminal CNVss 4 is short-circuited via the short-circuit 5 to set the writing control terminal CNVss 4 to a voltage level of the writing mode. However, as shown in Fig. 9, it is also possible that a thermostatic lead switch 15, which is open at a room temperature, is connected to the writing control terminal CNVss 4, a heater 14 is provided on the ROM writer 2 side, and when the ROM writer 2 is connected to the serial interface 7 of the electrical apparatus 1, the heater is turned ON to change the thermostatic lead switch 15 to a short-circuit mode

with heat of the heater at the time of connection, whereby the writing control terminal CNVss 4 is grounded to GND and the microcomputer of the electrical apparatus 1 is set to the writing mode. An advantage in this case is the same as that explained in the first embodiment; thus, an explanation of the advantage is omitted.

[0028]

Seventh embodiment

In the sixth embodiment, as shown in Fig. 10, the writing control terminal CNVss 4 is controlled by the thermostatic lead switch 15. However, the writing control terminal CNVss 4 may be controlled by a magnetic lead switch 16. A permanent magnet or an electromagnet 17 is provided on the ROM writer 2 side and, when the ROM writer 2 is connected to the serial interface 7 of the electrical apparatus 1, the magnetic lead switch 16 is changed to the short-circuit mode by the permanent magnet 57, whereby the microcomputer of the electrical apparatus 1 is set to the writing mode.

[0029]

In addition, when the electromagnet is provided on the ROM writer 2 side rather than the permanent magnet, it is also possible that when the ROM writer 2 is connected to the serial interface 7 of the electrical apparatus 1, a magnetic force is generated by applying an electric current to a coil to short-circuit the magnetic lead switch. An advantage in this case is the same as that explained in the first embodiment; thus, an explanation of the advantage is omitted.

[0030]

Eighth embodiment

In the first to the seventh embodiments, the method of directly short-circuiting the writing control terminal CNVss 4 and the GND terminal is explained. In this embodiment, a method of short-circuiting the writing control terminal CNVss 4 and the GND terminal by superimposing a control signal for short-circuiting the writing control terminal CNVss 4 to the GND level on a data signal transmitted from the ROM writer 2 to the TXD terminal and separating and extracting this control signal in the electrical apparatus 1 will be explained.

First, a structure and a function of the ROM writer 2 in this embodiment will be explained.

Fig. 11 is a diagram for explaining generation of a signal in the ROM writer 2.

[0031]

In the figure, a signal 21 is generated from a counter circuit on the basis of a clock source with speed sufficiently larger than transfer speed of data transmitted to the TXD terminal (e.g., whereas the transfer speed of data transmitted to the TXD terminal is 1 bit/104 us, the speed of the clock source is 1 bit/1 us). The signal 21 and a data signal transmitted to the TXD terminal are inputted to an AND circuit to create a logical product of the two signals (an AND signal).

[0032]

Next, a structure and a function of the electrical apparatus 1 in this embodiment will be explained.

Fig. 12 is a diagram explaining a component added to the electrical apparatus 1 and a function of the component (separating a signal transmitted from the ROM writer 2 into a data signal and a control signal to short-circuit the writing control terminal CNVss 4).

Compared with Fig. 1, a low-pass filter (hereinafter referred to as "LPF") and a D flip-flop (hereinafter referred to as "DFF") with an enable (ENA) are added to the electrical apparatus 1 anew.

[0033]

An operation of the electrical apparatus 1 will be hereinafter explained in accordance with a flow of a signal.

The AND signal (a signal 18), which is created by the ROM writer 2 as described above, is branched into two signals and one signal is inputted to the LPF. A pulse of a small width, which is a high-frequency component, and the like are removed from the signal 18 inputted to the LPF. As a result, as indicated by a signal 19, a signal outputted from the LPF reproduces an original signal before inputted to the AND circuit, although slightly rounded at a rising edge and a falling edge. This signal 19 is

inputted to the TXD terminal.

On the other hand, signals branched after passing the LPF are further branched and inputted to an ENA (ENABLE) terminal and a data input terminal (a D terminal) of the DFF, respectively. Signals branched before passing the LPF are directly inputted to the CLK terminal.

[0034]

Here, in the DFF, while an input of the ENA terminal is a high potential level "H", an input of the D terminal is latched at a first rising edge of a waveform inputted from the CLK terminal. In other words, the high potential level "H" inputted to the D terminal at this point is directly outputted as an output of an output terminal (a Q terminal, not shown). Therefore, as indicated by a signal 20, an output from a reversal output terminal (a Qn terminal) is a lower potential level "L" that is obtained by reversing this high potential level "H". This means that the output of the Qn terminal is switched to the high potential level "H" to a low potential level "L" at the first rising edge of the waveform inputted from the CLK terminal. If the writing control terminal CNVss 4 is connected to the Qn terminal, the microcomputer is switched to the writing mode.

[0035]

Once the output is changed to the low potential level "L", a reversal output of the DFF (an output from the Qn terminal) continues to be the low potential level "L" until the DFF is reset. Thus, after the writing ends, the DFF is reset.

In this way, it is also possible that the writing control terminal CNVss 4 is short-circuited to the ground level (the low potential level "L") using the flip-flop and the microcomputer of the electrical apparatus 1 is set to the writing mode.

[0036]

As another method of generating a waveform to be inputted to the A terminal in Fig. 12, it is also possible that, as shown in Fig. 13, in the beginning at the time of start of writing from the ROM writer 2, transfer speed of a serial interface is set to 115 Kbps, all DATA are set to "1" such that only a start bit of a first time is detected with a

structure of a UART (Universal Asynchronous Receiver/Transmitter) output format of "start bit" + 8 bit DATA" to generate a part of first data and, thereafter, data for writing a program is communicated by switching the transfer speed of the serial interface to 9.6 Kbps, whereby data from the ROM writer 2 to be transmitted to the electrical apparatus 1 is created. In this case, a first rising edge of the start bit is used for latching the D terminal. Note that a ratio of transfer speed (115 Kbps: 9.6 Kbps) is changed appropriately according to performance of the LPF.

[0037]

Since the electrical apparatus 1 is constituted as described above, as in the first embodiment the low potential level "L" for switching the microcomputer to the writing mode is obtained from the electrical apparatus 1 and the control signal for operation the short-circuit comprising the flip-flop circuit DFF is separated and extracted from the data signal of the ROM writer 2. Thus, it is unnecessary to change the ROM writer 2 according to specifications of the microcomputer of the electrical apparatus 1 and it is possible to provide the ROM writer 2 and an electrical apparatus having high universality and a writing method using the ROM writer 2 and the electrical apparatus. [Effects of the Invention]

As described above, in the writing method comprising an electrical apparatus 1 incorporating a nonvolatile memory in which data is rewritable when a writing control terminal is pulled down or pulled up to a predetermined voltage and a ROM writer that writes data in this nonvolatile memory, the electrical apparatus 1 includes a generation circuit for generating the predetermined voltage and the ROM writer includes means that connects the predetermined voltage generated by the generation circuit to the writing control terminal. Thus, it is unnecessary to change the ROM writer side according to specifications of a microcomputer of the electrical apparatus 1 and it is possible provide a ROM writer 2 and an electrical apparatus 1 with high universality and a writing method using the ROM writer 2 and the electrical apparatus 1.

[Brief Description of the Drawings]

[FIG. 1]

A diagram showing a state in which a home appliance is connected to an external network via an electrical apparatus (a communication adapter) according to a first embodiment of the invention.

[FIG. 2]

A diagram for explaining an operation for writing a program in a nonvolatile memory of the electrical apparatus according to the first embodiment of the invention.

[FIG. 3]

An explanatory diagram for explaining an operation for writing a program in a nonvolatile memory of another electrical apparatus according to the first embodiment of the invention.

[FIG. 4]

A diagram for explaining an operation for writing a program in a nonvolatile memory of an electrical apparatus according to a second embodiment of the invention.

[FIG. 5]

A diagram showing a structure of a part where the electrical apparatus and a ROM writer according to the second embodiment of the invention are connected.

[FIG. 6]

A diagram for explaining an operation for writing a program in a nonvolatile memory of an electrical apparatus according to a third embodiment of the invention.

[FIG. 7]

A diagram for explaining an operation for writing a program in a nonvolatile memory of an electrical apparatus according to a fourth embodiment of the invention.

[FIG. 8]

A diagram for explaining an operation for writing a program in a nonvolatile memory of an electrical apparatus according to a fifth embodiment of the invention.

[FIG. 9]

a diagram for explaining an operation for writing a program in a nonvolatile memory of an electrical apparatus according to a sixth embodiment of the invention.

[FIG. 10]

A diagram for explaining an operation for writing a program in a nonvolatile memory of an electrical apparatus according to a seventh embodiment of the invention.

[FIG. 11]

A diagram explaining signal generation by a ROM writer according to an eighth embodiment of the invention.

[FIG. 12]

A diagram for explaining an operation for writing a program in a nonvolatile memory of an electrical apparatus according to the eighth embodiment of the invention.

[FIG. 13]

A diagram showing another example of a signal generated by the ROM writer according to the eighth embodiment of the invention.

[Explanation of Reference Numerals]

- 1: Electrical apparatus
- 2: ROM writer
- 4: Writing control terminal (CNVss 4)
- 5: Short-circuit
- 6: Home appliance
- 7, 7': Serial interface
- 8: Photodiode
- 9: LED
- 10: Shielding rubber
- 11: Phototransistor
- 12: Switch
- 13: Relay
- 14: Heater
- 15: Thermostatic lead switch
- 16: Magnetic lead switch
- 17: Magnet/ Electromagnet
- 18: CLK signal waveform

- 19: LPF passing signal waveform
- 20: Flip-flop output signal waveform
- 21: Counter output signal waveform

[Name of Document] Abstract

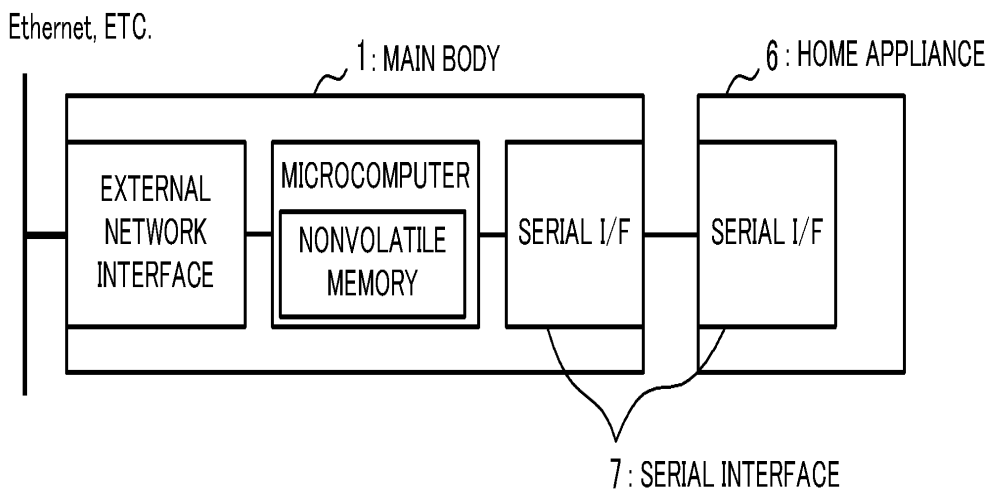
[Abstract]

[Object] To provide a ROM writer and an electrical apparatus with high universality that can be used regardless of specifications of microcomputers, and a writing method using the ROM write and the electrical apparatus.

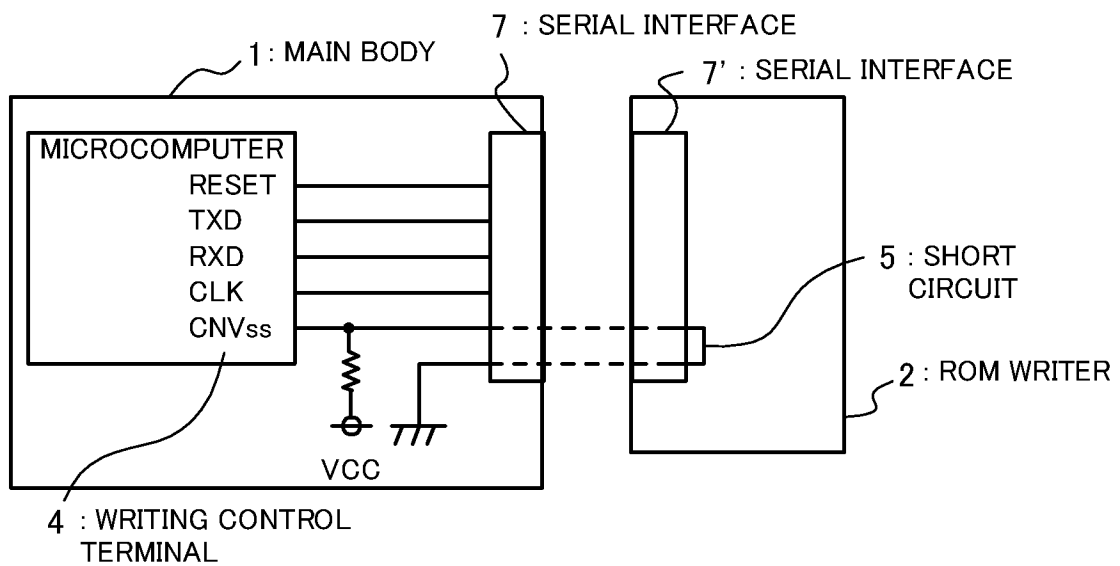
[Solution] The writing method is constituted of an electrical apparatus incorporating a nonvolatile memory in which data is rewritable when a writing control terminal is pulled down or pulled up to a predetermined voltage; and a ROM writer that writes data in the nonvolatile memory, where the electrical apparatus includes a generation circuit for generating the predetermined voltage and the ROM writer includes means that connects the predetermined voltage generated by the generation circuit to the writing control terminal.

[Selected Drawing] FIG. 1

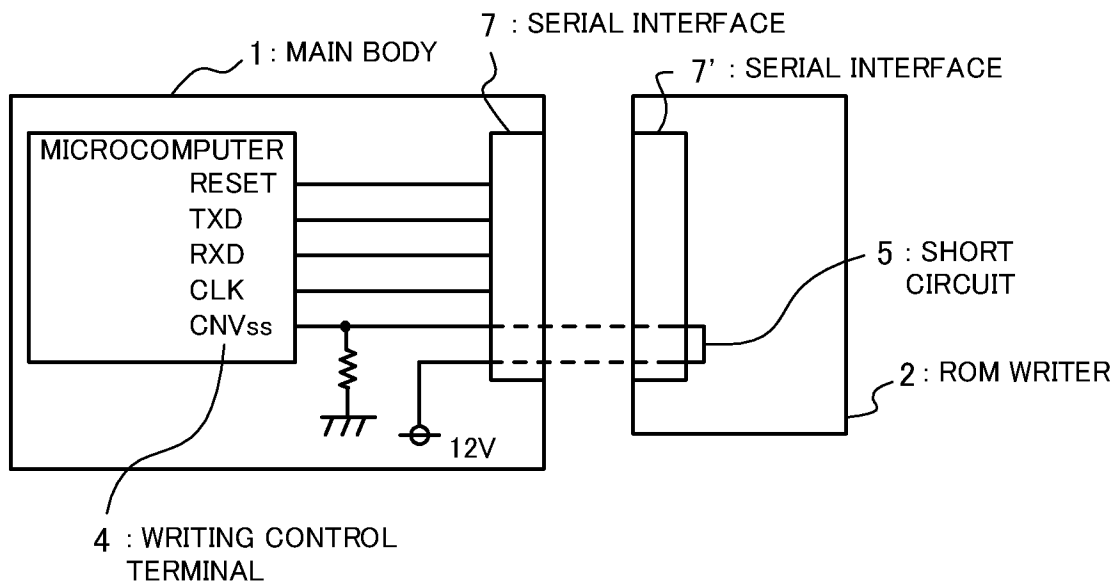
[FIG. 1]



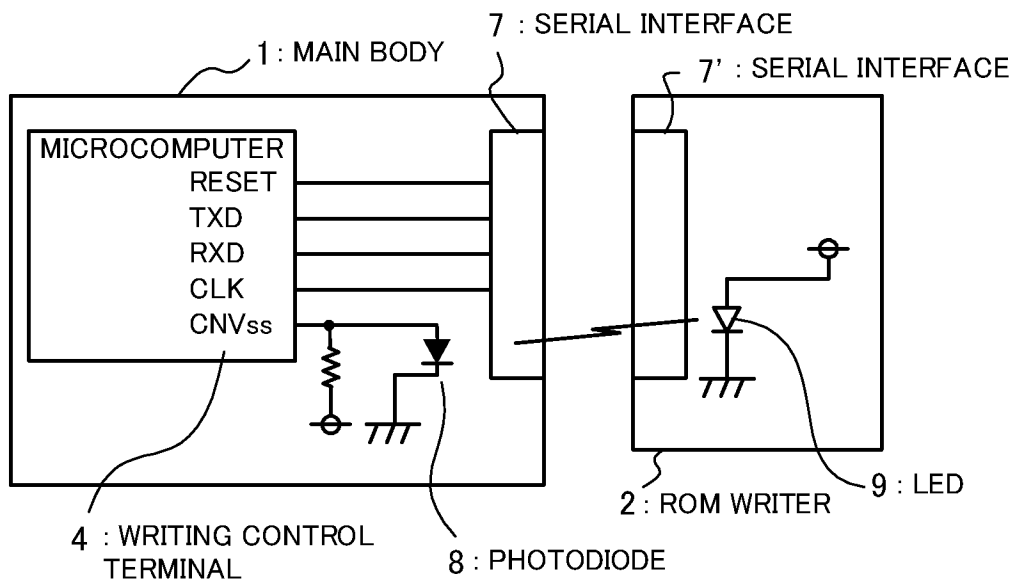
[FIG.2]



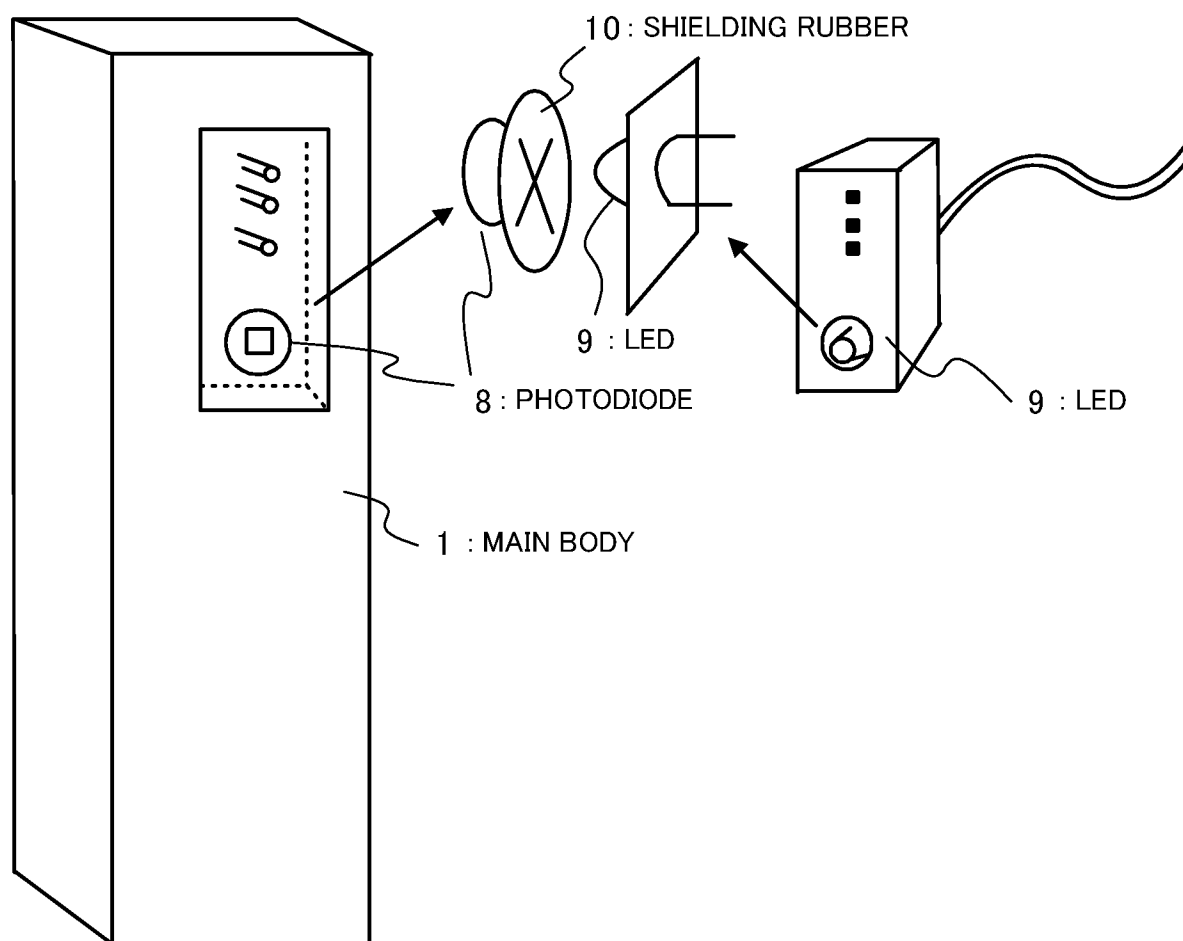
[FIG.3]



[FIG.4]



[FIG.5]



The diagram illustrates the system architecture, divided into two main sections: the Main Body and the Serial Interface.

Main Body (1):

- MICROCOMPUTER:** Contains the central processing unit with control lines: RESET, TXD, RXD, CLK, and CNV_{ss}.
- 4 : WRITING CONTROL TERMINAL:** Connected to the CNV_{ss} line of the microcomputer.
- 11 : PHOTOTRANSISTOR:** Receives light from the LED in the ROM Writer. Its base is connected to ground (GND) through a resistor, and its emitter is connected to ground.
- 7 : SERIAL INTERFACE:** Receives data from the ROM Writer and sends it to the microcomputer via TXD and RXD lines.

Serial Interface (7'):

- 2 : ROM WRITER:** The component that generates the data to be written. It is connected to the phototransistor and the serial interface.
- 9 : LED:** Emits light towards the phototransistor.

The diagram illustrates the ROM writer system, divided into two main components: the Main Body (1) and the ROM Writer (2).

1: MAIN BODY contains a **MICROCOMPUTER** with the following pins and connections:

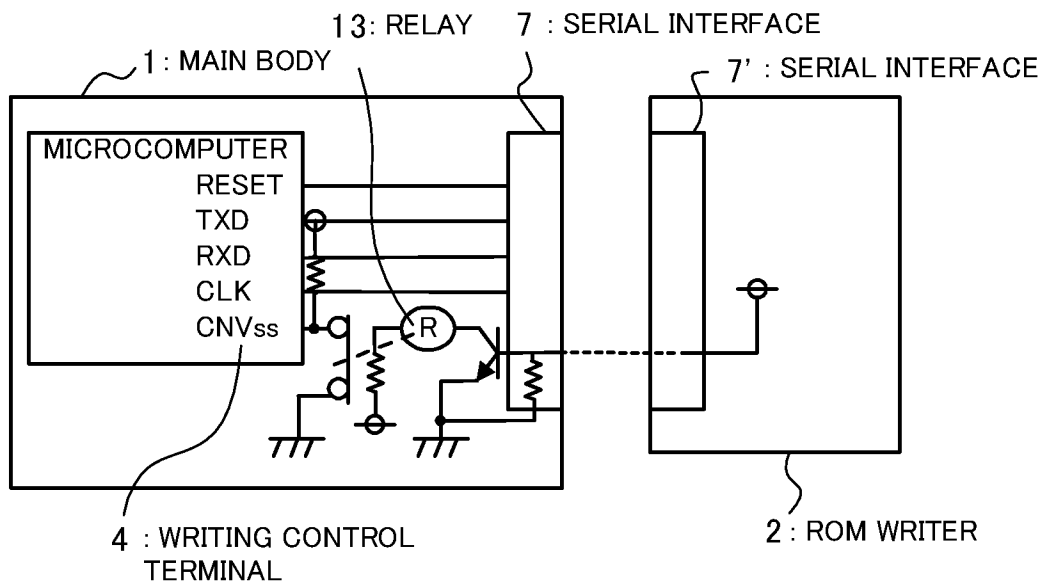
- RESET**: Connected to the top of the **7: SERIAL INTERFACE**.
- TXD**: Connected to the second pin of the **7: SERIAL INTERFACE**.
- RXD**: Connected to the third pin of the **7: SERIAL INTERFACE**.
- CLK**: Connected to the fourth pin of the **7: SERIAL INTERFACE**.
- CNV_{ss}**: Connected to a switch (12) through a resistor. The other end of the resistor is connected to ground (indicated by a circle with three lines). The switch (12) is also connected to ground.

4: WRITING CONTROL TERMINAL is located on the bottom left of the Main Body.

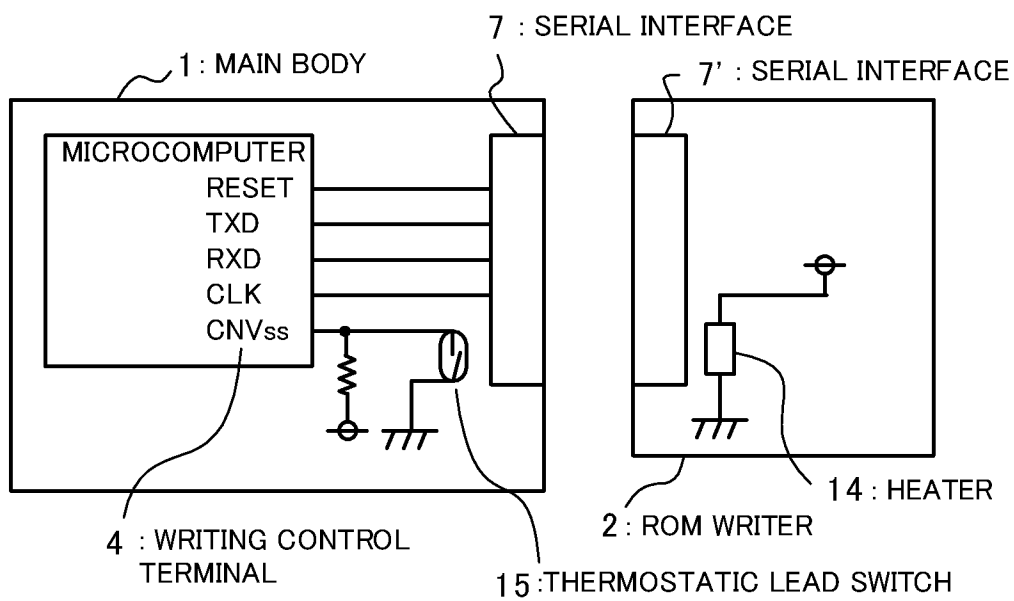
7: SERIAL INTERFACE is a vertical component on the right side of the Main Body.

2: ROM WRITER is a separate unit on the right, featuring a **7': SERIAL INTERFACE** at the top and a **PROJECTION** on the left side.

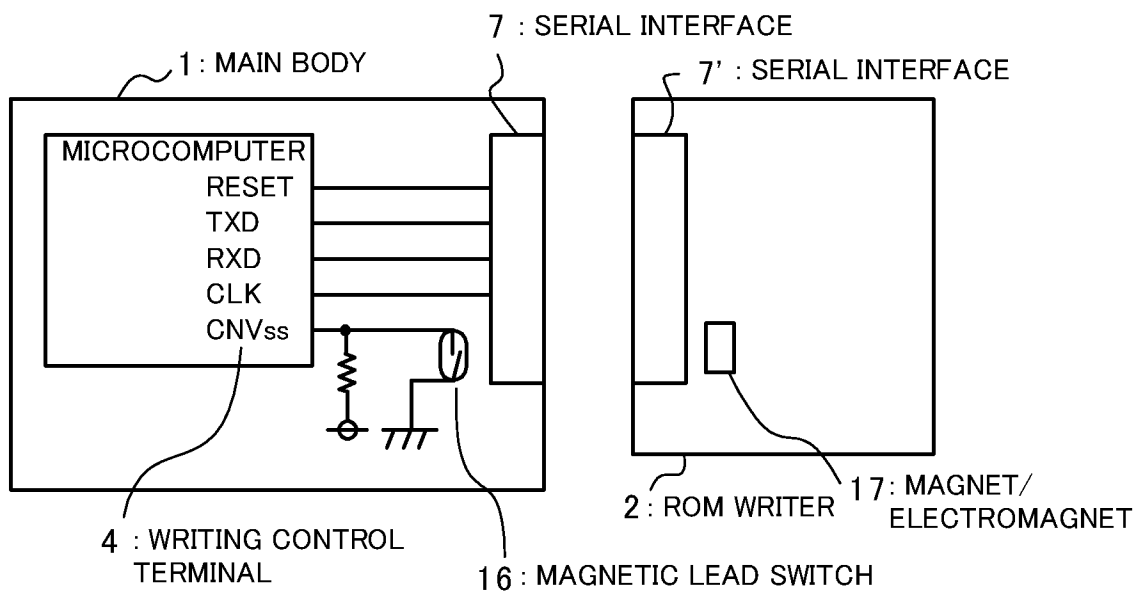
[FIG.8]



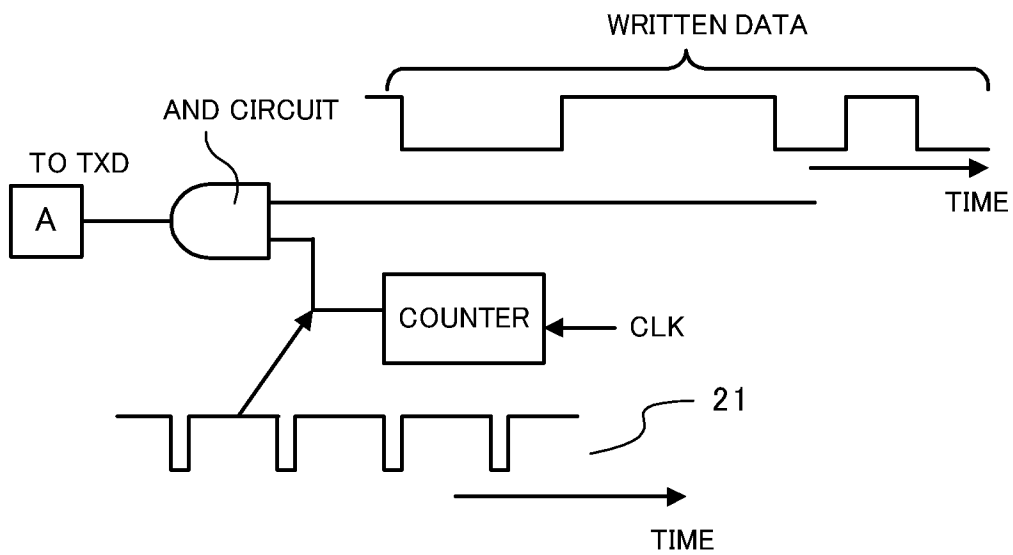
[FIG.9]



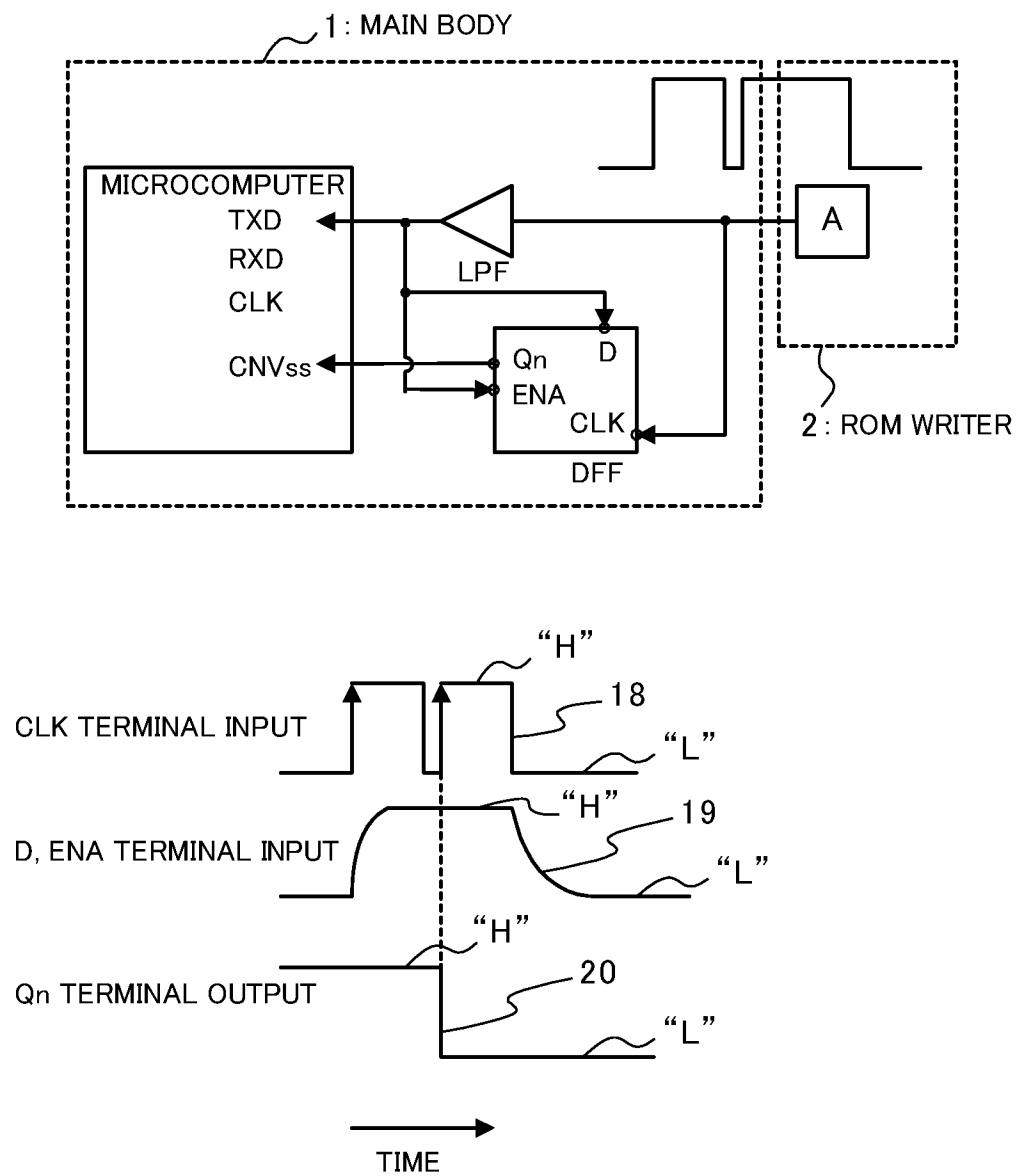
[FIG.10]



[FIG.11]



[FIG.12]



[FIG.13]

